



A Goal-Based Planning AI for Satellite Missions

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Overview

A finite state machine is a model often used for decision making problems. We use a system of goals and actions to produce a state machine which uses real-time telemetry to produce satellite activity schedules. This is then optimised to improve the performance of the state machine. On the satellite, the optimised state machine is driven to generate activity schedules.

Introduction

Satellites are usually driven using human-defined activity schedules uploaded periodically from the ground. This requires constant maintenance and means the satellite has limited ability to react to live telemetry. We demonstrate a new intelligent, reactive and assurable AI that is capable of autonomously driving a satellite using high-level goals and real-time telemetry data.

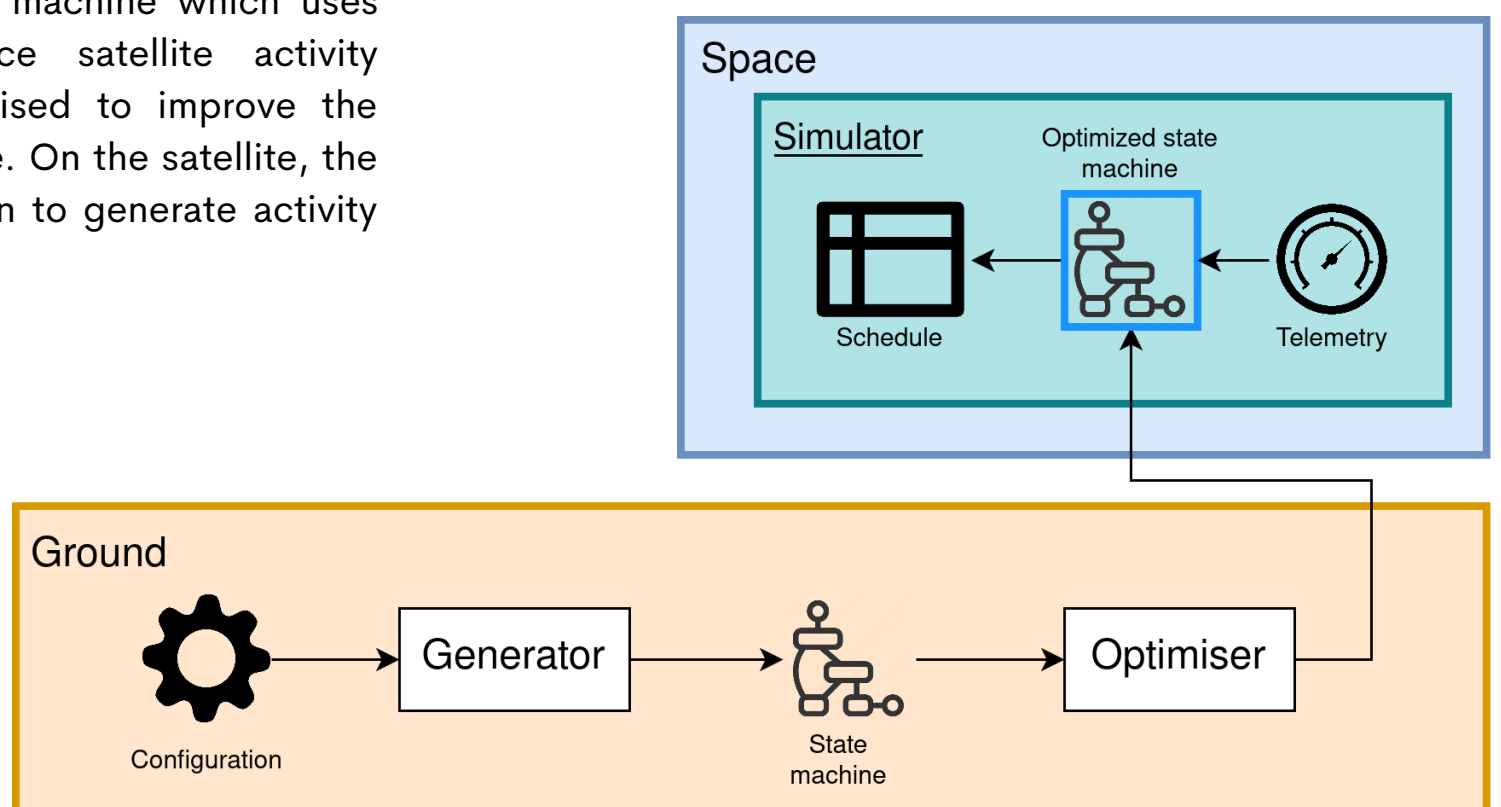


Fig 1. Block diagram

State machine representation

The states of the state machine represent an action that the satellite should take, a goal to achieve, or a requirement that should be met. Each transition has requirements associated with it. The action and goal nodes, when reached, generate schedule entries. As a result, driving the state machine generates a schedule

Each transition also has an associated cost determined by the telemetry it measures times a constant set by the optimiser. When multiple transitions in the state machine are possible, the one which leads to the smallest total cost is chosen. This allows the generated state machine to prioritise different goals based on telemetry.

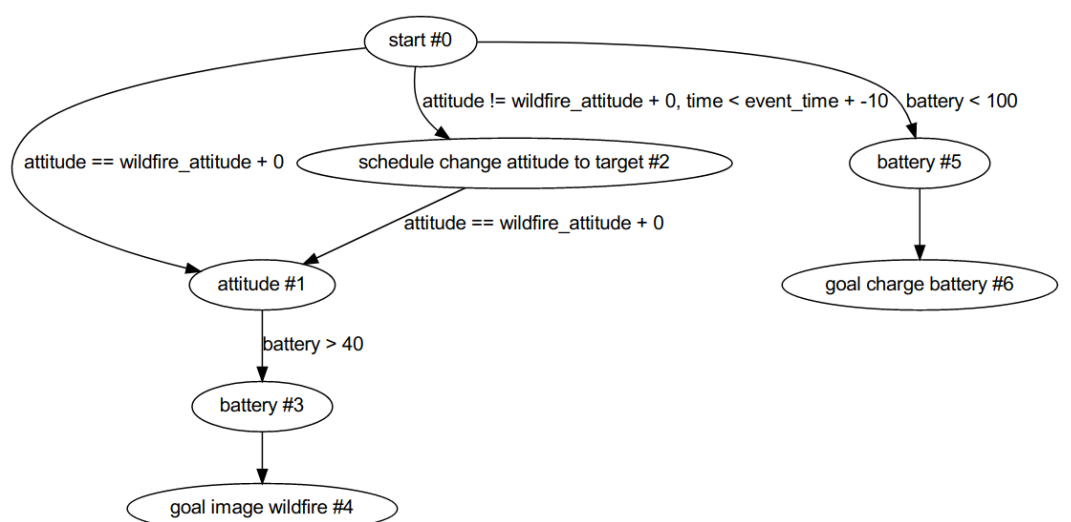


Fig 2. A diagram showing the generated state machine for a simple scenario where the goals are to image wildfires and charge the battery. Imaging a wildfire requires the satellite to be pointing to the wildfire and the battery to be charged above 40%.

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